THE U.S. PASSENGER CAR INDUSTRY IN THE 1980'S

A Thesis
Presented to
The Academic Faculty

By

Ling Yang

In Partial Fulfillment
Of the Requirement for the Degree
Master of Science in Economics

Georgia Institute of Technology

May, 2008

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Approved by:

Dr. Vivek Ghosal, Advisor
School of Economics
Georgia Institute of Technology

Dr. Maurizio Iacopetta
School of Economics
Georgia Institute of Technology

Dr. Rehim Kilic
School of Economics
Georgia Institute of Technology

Date Approved: November 18, 2007

ACKNOWLEDGEMENTS

I hereby give my special thanks to Dr. Vivek Ghosal at School of Economics, Georgia Institute of Technology, who patiently guided me through the entire composition process. I also want to thank him for his extraordinary teaching skills in Microeconomics and Industrial Organization, which helped me set up the framework of this thesis.

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SUMMARY

American automobile manufacturers experienced a bitter-sweet time during the 1980s. On one hand, they gained support from the government to prevent mass imports of small cars from Japan; while on the other hand, they still lost market share to their Japanese counterparts and ever since then, they have been facing fierce competition from the Japanese auto-makers. To better understand today's competition in the automobile market, it is crucial to study the industry in the 1980s when the scope of the market began to change. This paper focuses mainly on studying the compact car market in the 1980s, which was the primary competition field then. It first briefly introduces the rise of Japanese automobile industry, and the economic background of the decade. Then it examines the U.S. compact car segment in detail, and finally constructs a model to explain consumer decisions on purchasing compact cars. In the end, it gives suggestion to the Big Three companies according to the findings presented in this paper.

CHAPTER 1 THE RISE OF JAPANESE AUTOMOBILE INDUSTRY

Unlike other automobile companies in the world, Japanese started their industry by first manufacturing trucks. Trucks dominated the market through the pre-World War II period, with orders mainly from military. Sales were boosted again by the orders from the U.S. Army during the Korean War. Although mass production of trucks didn't help Japanese accumulate experience on manufacturing passenger cars, it prepared Japanese manufacturers with enough cash reserve for future technology transfer.

Believing automobile industry could stimulate other sectors of the economy, post-War Japanese put auto-manufacturers under protection. Low-interest bank loans kept firms away from bankruptcy and investing in car production. Japanese Ministry of International Trade and Industry (MITI) also exempted them from import duties on machines and tools purchased abroad and charged high import taxes on cars imported from America and Europe. MITI also provided the guidance to the development of Japanese passenger car industry. In 1955, MITI launched a "mini-car" proposal accelerated the end of 3-wheel vehicle produced in Japan but the proposal also created a "too-many-manufacturers but too small market" problem according to the government and company officials.

In 1961, trying to reduce competition in the market, MITI asked car manufacturers to specialize in only one type of vehicle: mini-cars, sports cars and other specialty automobiles. This announcement largely shaped the Japanese automobile industry since only small Japanese cars (with engine displacement up to 2000cc) remained protected from imports through the 1960s and

much of the 1970s. Since no American cars were this small and many European cars were above this limit, nearly all imported cars faced a 34% tax duty and Japanese automakers were finally able to export their models. In 1970, total production in Japan exceeded 5,000,000 units, of which 60% were cars and 40% were trucks.

A decade ahead of American counterparts in investing in small cars, Japanese automakers had been small-car experts already by 1970. The unique development pattern put Japanese automakers the biggest beneficiary in the upcoming oil crisis as small (or compact) cars dominated the U.S. market for about ten years.

CHAPTER 2 BACKGROUND

The most important factor that influences people's decision on what type of cars to purchase is oil price. Through 1970 to 2004, the world experienced eight major events that help reshape the oil industry as well as the world economy. From 1960 to 1972, the crude oil price was kept at about $3 per barrel (see Figure 2.1). Since 1974, the crude oil price has kept increasing from above $6 per barrel and never dropped below $10 again. The biggest oil price shock happened in 1979, when it rose above $10 per barrel and increased at a rate of $10 per year in the following subsequent three years and finally reached its highest point of the entire 1980s in 1983, at $32 per barrel.

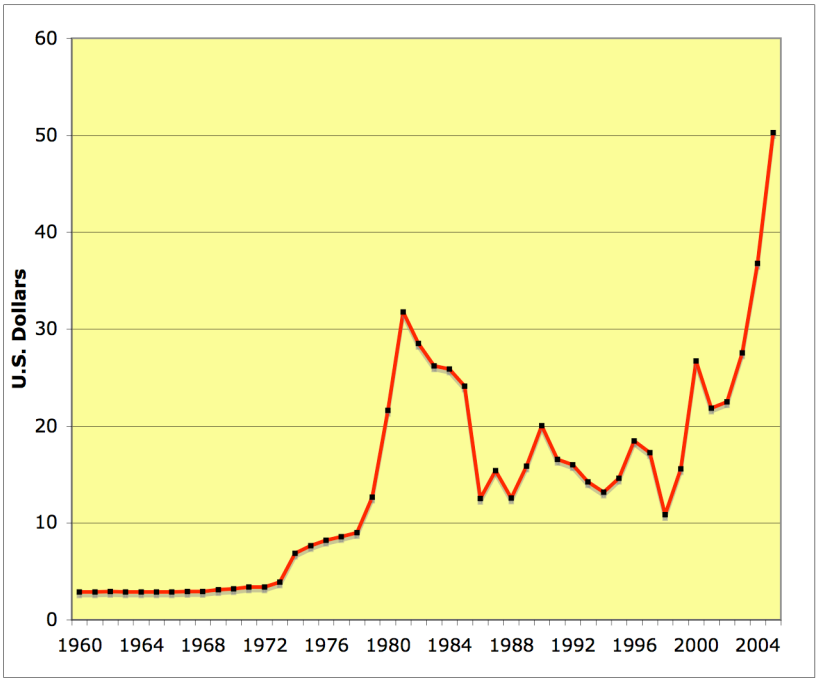

Figure 2.1 U.S. Crude Oil Wellhead Acquisition Price by First Purchasers (Dollars per Barrel)
Source: www.eia.doe.gov

The accident ended the period of low-price oil supply in the United States. The impact was huge on nearly every manufacturing industry, especially the automobile industry where there was no energy substitute for oil and the U.S. was the biggest car-consumption country in the world. It was very clear that high oil price changed people's consumption habit and opened new opportunity for foreign car manufacturers who were specialized in making smaller cars.

As the oil price began climbing since 1970, one big change in the automobile industry was the declining sales of full-size and luxury cars (see Figure 2.2). While both sales of compact cars and midsize cars were increasing through the 1970s, compact car sales increased much faster than that of midsize cars. During the subsequent three years of 1979, 1980 and 1981, when oil price soared at the fastest rate of the 1980s, the increase of compact car sales over-speeded that of midsize cars sales and finally its market share (including import) reached 50%, while the market share of full-size and luxury cars fell to around 20%. Since 1990, while the market share of full-size and luxury cars kept at a constant 20% level, midsize cars have become the dominant segment.

The explanation for the above change is consumers' preference shifted from full-size and luxury cars to fuel-efficient cars along with the fast-climbing oil price. Due to limitation from technology, the only way to make cars more fuel-efficient was to make it small. That is why we see the increasing market share of compact cars. We can also deduce that the innovation of automobile technology through the 1980s was to make cars more fuel-efficient while bigger. In 1990, most car manufacturers successfully upgraded their compact models to mid-size models. Also, because of the relatively low oil price compared to the early 1980s, midsize cars became

the most popular segment in the market. However, since oil price was more fluctuating in the last two decades and never fell to $3 per barrel as where it was in 1960s again, full-size and luxury cars have never won back their past golden age.

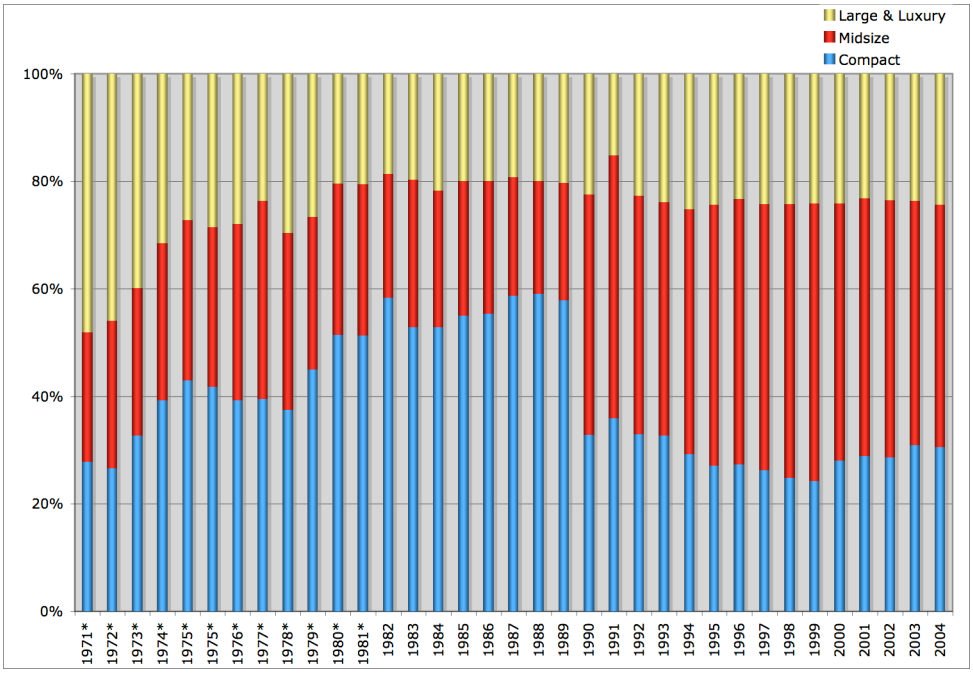

Figure 2.2 Percent of sales in the U.S. by market segmentation
* Only domestic-made data available.
Source: Ward's automotive yearbook.

CHAPTER 3 COMPACT CAR SEGMENT

To better examine the change in the passenger car industry after the oil price shock, I focus on the study of compact car segment from 1975 to 1989. I construct the industry profile in Table 2 including three American automobile-manufacturers: General Motors Corporation, Ford Motor Company and the Chrysler Corporation (Former DaimlerCrysler AG), and three Japanese automobile-manufacturers: the Toyota Motor Corporation, Nissan Motor Company and Honda Motor Company.

Table 3.1 Fifteen-year market data (1975-1989)

Company name	Average annual unit sales	Unit sales growth rate	Average predicted reliability*
GM	1,505,671	0.029	1.81
Ford	1,063,240	0.006	2.54
Chrysler	684,969	0.048	2.63
Toyota	500,984	0.081	4.97
Nissan	397,092	0.061	4.28
Honda	429,848	0.242	4.63
Average	763,634	0.078	3.48

* 5 – Much better than average
4 – Better than average
3 – Average
2 – Worse than average
1 – Much worse than average

Source: Ward's automotive yearbook; Consumer reports, buying guide.

Although the Big Three had larger annual unit sales of compact cars from 1975 to 1989, their sales growth rates were far behind the industry average level. The main reason was the poor quality of American models. According to the reliability ratings published every December on Consumer Reports, none of the average ratings of the Big Three models was above average (Table 3.1).

Besides high oil price, another important factor that influenced U.S. passenger car industry was the trade restraints on Japanese automobiles. The detail of the restraints was summarized in Feenstra (1988). Beginning April 1981 to 1983, Japanese limited their automobile sales to a total of 1,832,500 units, of which 1.68 million were passenger cars. The quotas were allocated to Japanese firms by their government. From April 1984 to March 1985, the restraints were continued and raised to a total of 2.016 million units. Following this, the Japanese government continued the restraint each year at 2.506 million annually from April 1985 to March 1988. This quota included 2.3 million passenger cars. The U.S. government did not request the latter two extensions. To examine the impact of the trade restrains, I broke down the fifteen-year data into three five-year periods, summarizing in the following tables (Table 3.2, 3.3, and 3.4).

Table 3.2 Five-year market data I (1975-1979)

Company name	Average annual unit sales	Unit sales annual growth rate	Average predicted reliability*
GM	1,390,146	0.081	2.15
Ford	1,221,466	0.044	2.68
Chrysler	654,053	0.161	2.42
Toyota	394,607	0.177	5.00
Nissan	327,008	0.210	3.93
Honda	221,030	0.570	3.90
Average	701,385	0.207	3.35

* 5 – Much better than average
4 – Better than average
3 – Average
2 – Worse than average
1 – Much worse than average

Source: Ward's automotive yearbook; Consumer reports, buying guide.

Table 3.3 Five-year market data II (1980-1984)

Company name	Average annual unit sales	Unit sales annual growth rate	Average predicted reliability*
GM	1,449,177	0.004	1.27
Ford	930,776	-0.059	2.78
Chrysler	669,167	0.061	3.02
Toyota	521,546	0.002	5.00
Nissan	436,361	-0.015	4.51
Honda	404,290	0.080	5.00
Average	735,220	0.012	3.60

* 5 – Much better than average
4 – Better than average
3 – Average
2 – Worse than average
1 – Much worse than average

Source: Ward's automotive yearbook; Consumer reports, buying guide.

Table 3.4 Five-year market data III (1985-1989)

Company name	Average annual unit sales	Unit sales annual growth rate	Average predicted reliability*
GM	1,677,689	0.003	2.01
Ford	1,037,477	0.032	2.16
Chrysler	731,686	-0.078	2.46
Toyota	586,800	0.064	4.92
Nissan	427,908	-0.011	4.40
Honda	664,223	0.074	5.00
Average	854,297	0.014	3.49

* 5 – Much better than average
4 – Better than average
3 – Average
2 – Worse than average
1 – Much worse than average

Source: Ward's automotive yearbook; Consumer reports, buying guide.

Although the intension of the trade restraints was to protect domestic car-manufacturers, the Big Three still experienced a lower sales growth rates during the trade restraints period, compared to the period from 1975 to 1979. One explanation is the consumers were more prudent when spending money on cars when they faced high-rocketed oil price. They might delay purchasing

new models. Another explanation is consumers still kept buying Japanese cars because their compact models were more reliable even though the imported ones might be more expensive. The trade restraints actually intrigued the Japanese manufacturers to improve their product quality. Nissan's ratings were raised from an average 3.93 (1975-1979) to 4.51 (1980-1984); Honda's rating was from 3.90 (1975-1979) to 5.00 (1980-1984). However, the quality ratings of the Big Three models were still below average in the trade restraints period.

The competition between three Japanese firms was also fierce. Nissan, which had the lowest quality rating among the Japanese three, had a negative sales growth rate both in the period of 1980-1984 and 1985-1989. Because of the trade restraints, all of the three Japanese firms experienced a sharp decrease in unit sales growth rate from 1980 to 1984. However, Honda remained a higher growth rate than its other two counterparts. The reason was Honda built up its first transplants in the U.S. and started producing domestic-made cars in 1983. In order to expand market share, Nissan and Toyota began producing cars domestically in 1985 and 1986, respectively. The result was their sales growth rates bounced back even though the restraint was more stringent.

As indicated in the previous paragraphs, the Big Three adjusted too slow to the market change and never succeeded in launching a good-quality model. They did not show interest in compact cars before the 1979 oil crisis. As Table 3.5 shows, GM was the first U.S. manufacturer that responded to the increasing oil price by introducing more compact models to the market. Ford and Chrysler followed the same strategy, which was easy to understand – more models could satisfy more diversified demands and thus helped firms gain more market shares. But poor

quality of American cars had a negative impact on the consumers' choice. To give readers a better idea of the change pattern in the market, I list the number of the models of the Big Three and the three Japanese manufacturers that exited the market. More American models exited the market after 1984, when the trade restraints officially ended. The large exit rate also affected the sales growth rate. GM, with an exit of 13 models between 1985 and 1989, experienced a decline of annual sales growth rate from 0.04 of 1980-1984 to 0.03 of 1985-1989. Chrysler was even worse. Its annual sales growth rate declined from 0.061 of 1980-1984 to -0.078 of 1985-1989 while six models exited the market between 1985 and 1989.

Table 3.5 Numbers of models of Big Three

Year	GM	Ford	Chrysler
1970	5	5	2
1971	6	5	4
1972	7	5	4
1973	8	5	4
1974	12	7	4
1975	14	8	5
1976	14	8	7
1977	14	9	9
1978	13	9	9
1979	12	9	9
1980	11	11	11
1981	12	11	10
1982	12	8	12
1983	13	10	16
1984	17	7	16
1985	17	7	16
1986	17	6	19
1987	17	6	19
1988	17	7	16
1989	14	7	16

Source: Ward's automotive yearbook.

Table 3.6 Exit and average market life of compact car models

Company name	Exited before 1979	Exited between 1979-1984	Exited between 1985-1989	Changed to midsize	No. of models exited in or after 1989	Average market life longer than 10 years	
GM	3	4	13	5	24	9	37.50%
Ford	0	8	3	2	15	8	53.33%
Chrysler	2	3	6	2	22	6	27.27%
Toyota	1	1	3	3	8	5	62.50%
Nissan	2	1	2	2	8	4	50.00%
Honda	0	0	2	2	5	4	80.00%

Source: Ward's automotive yearbook.

Another way to measure models' performance was their market life. The last three columns of Table 3.6 lists the number of models exited in or after 1989, the number of models (exited in or after 1989) whose market life longer than 10 years and the ratio of the two. GM and Chrysler had the largest number of models that exited the market after 1989, and fewer of them had a market life longer than 10 years. Figure 3.1 shows the predicted reliability from 1975 to 2004 of the six car manufacturers. Toyota and Honda always had an above-average rating in the industry; Nissan performed a declining reliability; GM and Ford performed a increasing reliability with Ford having a faster rate; Chrysler performed the most volatile one. The better the reliability, the lower the exit rate. It demonstrates the importance of the role of quality playing in the passenger car industry.

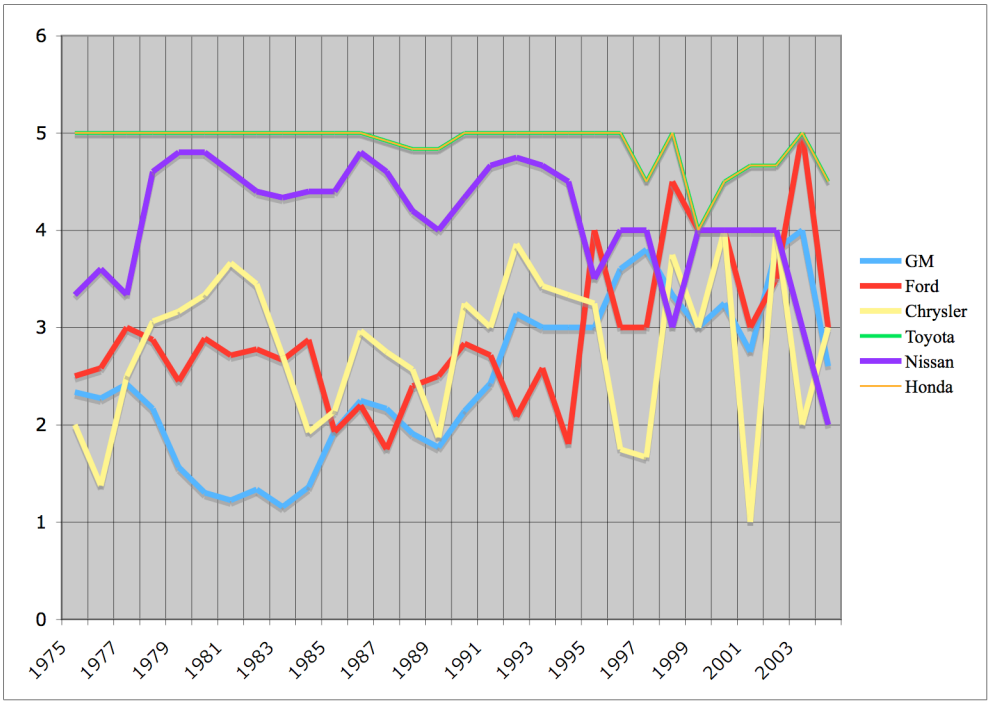

Figure 3.1 Predicted reliability (1975-2004)

Note: 5 – Much better than average;
4 – Better than average;
3 – Average;
2 – Worse than average;
1 – Much worse than average

Source: Consumer reports, buying guide.

The Big Three were not compact car experts either. In the 1980s, all the three manufacturers had captive imports, most of which were produced by Japanese manufacturers. The quality ratings of those import captives were better than the overall average ratings of the Big Three models. The reason that Chrysler had a better quality rating among the three was it had more captive imports from Japan. Table 3.7 shows the lower average ratings of the Big Three models if we exclude the ratings of captive imports.

Table 3.7 Captive imports of the Big Three

Import captive	Average rating
GM (1975-2004), with captive imports	**2.19**
w/o captive imports	**1.97**
Chevrolet Sprint (1984-1988)	3.00
Chevrolet Spectrum (1984-1988)	3.20
Geo Prizm (1985-2002)	4.69
Geo Storm (1989-2004)	3.00
Ford (1975-2004), with captive imports	**2.68**
w/o captive imports	**2.65**
Ford Fiesta (1977-1981)	4.33
Chrysler (1975-2004), with captive imports	**2.77**
w/o captive imports	**2.45**
Plymouth Arrow (1977-1980)	4.00
Plymouth Sapporo (Conquest) (1977-1987)	4.20
Plymouth Vista (1983-1990)	3.38
Dodge Challenger (Conquest) (1977-1987)	4.20
Dodge Vista (1983-1990)	3.17
Dodge Colt (1977-1995)	4.39

Source: Consumer reports, buying guide.

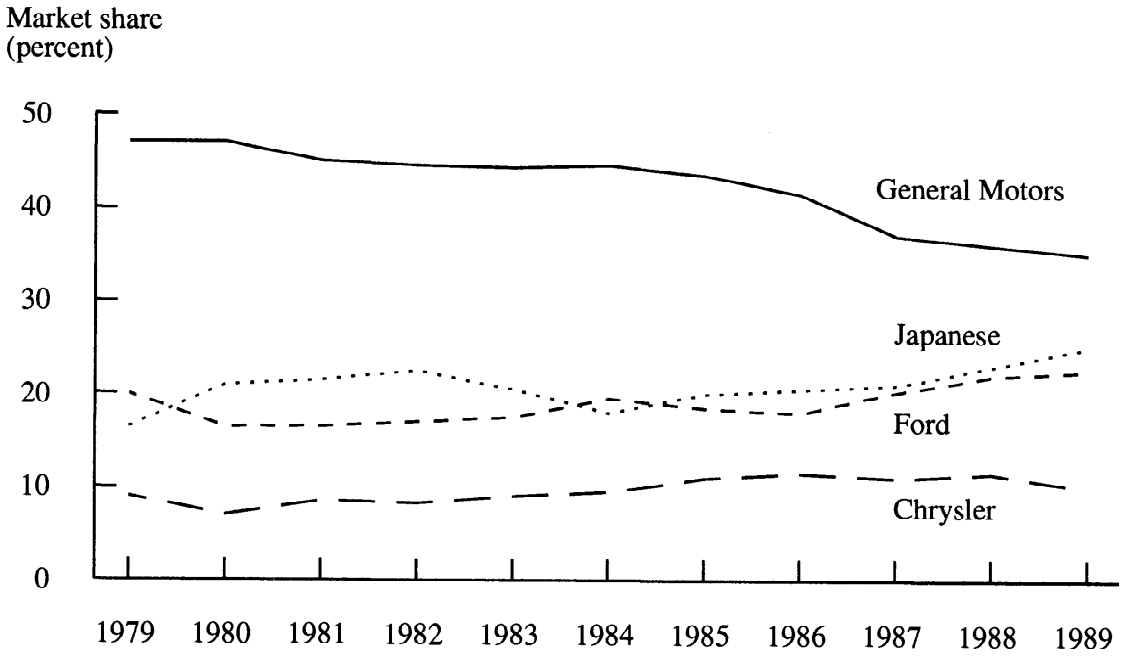

Figure 3.2 Share of U.S. Automobile Market
Source: Mannering and Winston (1988).

Figure 3.2 shows the increase of market share of Japanese car manufacturers. Also, it shows GM, whose compact cars had the worst quality ratings, had a steadily decreasing market share in the 1980s. But poor quality was not the only reason that dragged down the market share of the Big Three: GM's quality ratings increased in the late 1980s, but it didn't help GM stop losing market share. One possible explanation was the decreasing brand loyalty. Because Japanese manufacturers established strong reputation in the oil-price-skyrocketed period, consumers were more likely to stay with the choice of Japanese cars even though the oil price began declining in the late 1980s. This loyalty was not only applied to the compact categories. We see the three Japanese manufacturers upgraded some of their compact cars in 1990 to midsize ones to compete in the midsize market, which was more profitable than the compact car segment. The reputation of those models that was developed earlier was carried on to the midsize category.

CHAPTER 4 BRAND LOYALTY AND CONSUMPTION DECISION

Cars are durable goods. When consumers make decisions on what brand or model to buy, they are more scrutinized and less influenced by advertisement only. Instead, they rely more on their own financial situation, fuel price as well as "word-of-mouth" reputations. Because of advanced information channels, consumers are able to gain insightful knowledge of future economy and different models of passenger cars. In this section, I constructed a linear model considering both fuel price and cars' reputation. Although there are other factors, such as household income and personal taste that affect the consumption decision, the measurement of those factors is beyond the scope of this paper and is not considered here.

$$Cars_{i,t} = \alpha + \beta_1 \Delta Cars_{i,t-1} + \beta_2 \Delta Cars_{i,t-2} + \beta_3 \Delta Oil_t + \beta_4 \Delta Oil_{t-1} + \varepsilon_{i,t} \qquad (1)$$

Equation (1) above shows the linear model used to test reputation and fuel price on consumption decision. $Cars_{i,t}$ denotes the sales of model i in time period t, $\Delta Cars_{i,t\text{-}1}$ denotes the sales difference of model i between period t-1 and period t-2, while $\Delta Cars_{i,t\text{-}2}$ denotes the sales difference of model i between period t-2 and period t-3. By including these two variables in the model we can testify the effect of accumulated over-the-years reputation on consumers' decision on car purchasing. We can expect the larger the positive difference, which means more people bought the model in the previous period, the larger sales of the model in the current period. The third and fourth variables ΔOil_t and $\Delta Oil_{t\text{-}1}$ denote the oil price changes in current period t and previous period t-1, respectively. They measure the fuel price impact on compact car consumption decision. We can expect the larger the positive change in oil price, the more sales of compact cars. It is clear that current consumption decisions rely heavily on the results from the previous periods other than from the current one, because information need time to be

transferred to the consumers and people need time to process that information. This model also tests whether the information from the older or the newer previous periods has more influence on consumers' decision.

The cars sales data used here are from the following five models: Chevrolet Camaro, Pontiac Firebird, Ford Mustang, Honda Accord and Toyota Camry and *t* starts from 1975 to 1989, totally fifteen observations for each model. The regression results are shown as follows:

Table 4.1 Regression result of Chevrolet Camaro

Source	SS	df	MS	Number of obs =	15
Model	1.9003e+10	4	4.7508e+09	F(4, 10) =	3.50
Residual	1.3576e+10	10	1.3576e+09	Prob > F =	0.0492
Total	3.2579e+10	14	2.3271e+09	R-squared =	0.5833
				Adj R-squared =	0.4166
				Root MSE =	36846

CarsCCt	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
dCarsCCt_1	.7661045	.2729689	2.81	0.019	.1578919	1.374317
dCarsCCt_2	.2103243	.2427766	0.87	0.407	-.3306156	.7512642
dOilt	-714.1951	2166.237	-0.33	0.748	-5540.872	4112.482
dOilt_1	2370.995	2085.638	1.14	0.282	-2276.095	7018.086
_cons	162307.5	9733.312	16.68	0.000	140620.3	183994.7

Table 4.2 Regression result of Pontiac Firebird

Source	SS	df	MS		
Model	1.0383e+10	4	2.5956e+09	Number of obs =	15
Residual	7.9714e+09	10	797139850	F(4, 10) =	3.26
Total	1.8354e+10	14	1.3110e+09	Prob > F =	0.0592
				R-squared =	0.5657
				Adj R-squared =	0.3920
				Root MSE =	28234

CarsPFt	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
dCarsPFt_1	.8517129	.2864651	2.97	0.014	.2134289	1.489997
dCarsPFt_2	.2822659	.2615318	1.08	0.306	-.3004632	.8649951
dOilt	246.2037	1639.076	0.15	0.884	-3405.885	3898.292
dOilt_1	2725.694	1655.949	1.65	0.131	-963.9909	6415.38
_cons	96197.31	7462.733	12.89	0.000	79569.31	112825.3

Table 4.3 Regression result of Ford Mustang

Source	SS	df	MS		
Model	1.2076e+10	4	3.0190e+09	Number of obs =	15
Residual	1.6831e+10	10	1.6831e+09	F(4, 10) =	1.79
Total	2.8907e+10	14	2.0648e+09	Prob > F =	0.2067
				R-squared =	0.4178
				Adj R-squared =	0.1849
				Root MSE =	41026

CarsFMt	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
dCarsFMt_1	.386574	.1927481	2.01	0.073	-.0428955	.8160436
dCarsFMt_2	.1279268	.2024444	0.63	0.542	-.3231475	.5790011
dOilt	2664.326	2325.984	1.15	0.279	-2518.29	7846.941
dOilt_1	97.27946	2187.631	0.04	0.965	-4777.067	4971.626
_cons	173909.8	10721.25	16.22	0.000	150021.4	197798.3

Table 4.4 Regression result of Honda Accord

Source	SS	df	MS		
				Number of obs =	15
				F(4, 10) =	2.25
Model	9.1000e+10	4	2.2750e+10	Prob > F =	0.1362
Residual	1.0117e+11	10	1.0117e+10	R-squared =	0.4735
				Adj R-squared =	0.2630
Total	1.9217e+11	14	1.3726e+10	Root MSE =	1.0e+0

CarsHAt	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
dCarsHAt_1	-.8410398	2.270045	-0.37	0.719	-5.899016	4.216936
dCarsHAt_2	3.444594	1.562879	2.20	0.052	-.0377183	6.926907
dOilt	-3224.213	6979.957	-0.46	0.654	-18776.53	12328.1
dOilt_1	-14847.92	8807.567	-1.69	0.123	-34472.4	4776.566
_cons	157960.9	54696.29	2.89	0.016	36090.02	279831.9

Table 4.5 Regression result of Toyota Camry

Source	SS	df	MS		
				Number of obs =	15
				F(4, 10) =	7.84
Model	6.8354e+10	4	1.7089e+10	Prob > F =	0.0040
Residual	2.1798e+10	10	2.1798e+09	R-squared =	0.7582
				Adj R-squared =	0.6615
Total	9.0152e+10	14	6.4395e+09	Root MSE =	46689

CarsTCt	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
dCarsTCt_1	1.61071	.6459885	2.49	0.032	.1713574	3.050062
dCarsTCt_2	1.383092	.6816237	2.03	0.070	-.1356606	2.901844
dOilt	729.815	2579.753	0.28	0.783	-5018.234	6477.864
dOilt_1	-3640.9	2672.391	-1.36	0.203	-9595.359	2313.559
_cons	62091.54	14683.05	4.23	0.002	29375.66	94807.41

As the discussion of the relationship between the dependent variable and the independent variables before, the four coefficients β_1, β_2, β_3 and β_4 are expected to be positive. Thus, the model better explained the sales of Chevrolet Camaro, Pontiac Firebird, Ford Mustang and

Toyota Camry than that of Honda Accord. Also, the *p*-values show consumers depended more on previous years' sales performance than the oil price change. It indicates that, even during the period that oil price was not skyrocketed, consumers still showed preference to cars that had good reputation. Furthermore, the *p*-values also show the sales performance one period before the current one played a more important role than that of older periods in consumers' decision-making.

The model's failure of explaining the sales of Honda Accord can be the result of strong growth of the model since entering the market in 1975 (see Figure 4.1) and its reputation developed by Honda's other U.S.-made models (Honda was the first Japanese manufacturers that built transplant in the U.S. territory in the 1970s).

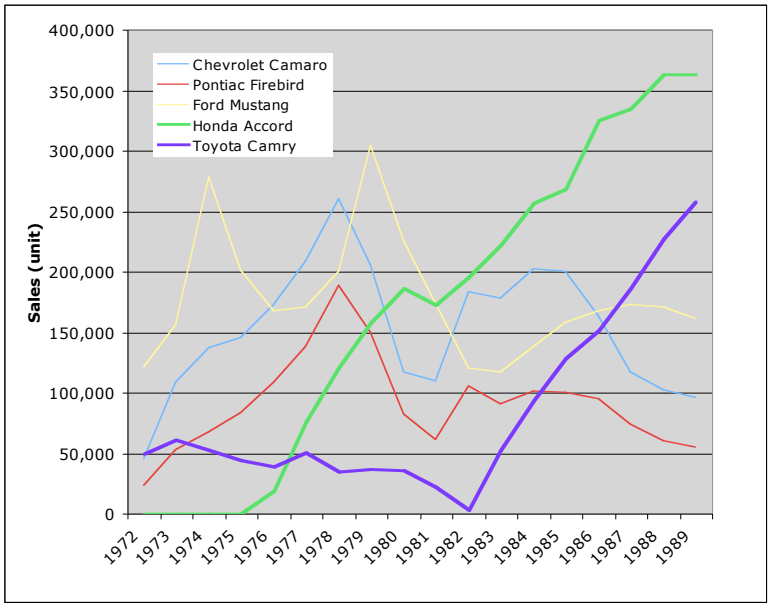

Figure 4.1 Unit sales of chosen models (1972 - 1989)
Source: Ward's automotive yearbook.

CHAPTER 5 IMPLICATIONS

The whole 1980s was a period for American auto-makers to accumulate bad reputation of their models while their Japanese counterparts did just the opposite. The quality of the models of the Big Three remained below average for about fifteen years. Once the bad reputation establishes, it is hard to win consumers' trust again, which is one of the reason for the failures of the Big Three to catch up with the Japanese in the 2000s even though their quality ratings have been improved. However, the quality of American cars is still far behind that of the Japanese.

Auto industry is a commodity industry. The core competence of an auto company is the product, not the service or any cost saving techniques. The strategy to be outstanding in the industry is to provide the consumers first-class-quality cars. Reducing cost only cannot win the consumers back because the life of cars last more than one year and consumers purchase the car for future use. From the evidence presented in this paper, even though in the first five years of 1980s when the U.S. restrained imports from Japan, it didn't deter consumers' decision on buying more expensive Japanese cars because of their superior reliability. This can be a good example to defend the Big Three's blame of higher labor costs as the reason for their weak financial performance.

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